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CASE REPORT

Complete atrioventricular block due to venous stent migration from innominated vein to right ventricle: A case report

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Summary A 78-year-old man who had been treated with maintenance hemodialysis for chronic renal failure was admitted with severe edema in left arm for 1 month. Venous angiography showed a severe stenosis in left innominate vein, then, he underwent percutaneous balloon angioplasty and venous stenting (Wall Stent RP). His arm edema soon improved after angioplasty, however, he complained of general fatigue and bradycardia 2 days after the venous angioplasty. Electrocardiogram showed complete atrioventricular block with 35 wide QRS complexes per minute. His echocardiogram showed a pipe-shaped structure with multiple slit and acoustic shadow in right ventricle. His radiographical right ventriculogram revealed the migrated venous stent from innominate vein to right ventricle. We tried to perform percutaneous transvenous stent extraction using Goose-Neck snare catheter, however, the wall stent stuck in the right external iliac vein, and contrast media leaked to the outside of the vascular wall. Therefore, we implanted this stent in the iliac vein with optimal-sized balloon inflation, and succeeded in stopping bleeding. Complete atrioventricular block was recovered to sinus rhythm with left bundle branch block just after the removal of the venous stent from right ventricle, and no cardiovascular events occurred after the treatment.

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Introduction

It has been reported that transient atrioventricular block is caused by mechanical and physiological disorders such as trauma, myocardial ischemia, infection, neurally mediated and/or metabolic diseases, and iatrogenic injury of the atrioventricular node (catheter, radiofrequency energy, surgical procedure, and drug-induced) [1].

It is well known that dislodgement and/or migration of the intravascular stent are major complications in radiological intervention [2—7], however, there are few reports regarding stent migration from innominate vein to intra-cardiac cavity causing transient and complete atrioventricular block.

Percutaneous transvascular stent extraction using Goose-Neck snare catheter is thought to be a useful procedure to retrieve it [3,6,8,9]. Although Goose-Neck snare catheter is a popular procedure for stent extraction, we experienced stent sticking in the external iliac vein and vascular rupture. Herein, we report the intracardiac migration of the vascular stent and the pitfall of using percutaneous stent extraction.

Case report

A 78-year-old man who had been treated with maintenance hemodialysis for 2 years due to chronic renal failure was admitted with severe edema in his left arm, which had an arterio-venous shunt for dialysis, for 1 month. His venous angiography showed a severe stenosis in left innominate vein, then, he underwent percutaneous balloon angioplasty (Synergy balloon catheter, Boston Scientific, Natick, MA, USA; 10 mm in diameter and 4.0 cm in length) and venous stent implantation (Wall Stent RP, Boston Scientific; 10 mm/3.9 cm). Although his arm edema soon improved after angioplasty, he complained of general fatigue and bradycardia 2 days after the venous angioplasty. His electrocardiogram showed left bundle branch block with sinus rhythm on admission, and complete atrioventricular block with 35 wide QRS complexes per minute 2 days after the operation. He did not receive oral administration of anti-arrythmic medicine, and circulating levels of electrolyte, including sodium, potassium, and magnesium levels, were normal. His echocardiogram showed global reduced motion and eccentric hypertrophy in left ventricle (60 mm in left ventricular end-diastolic dimension and 30% in fractional shortening) and a pipe-shaped structure

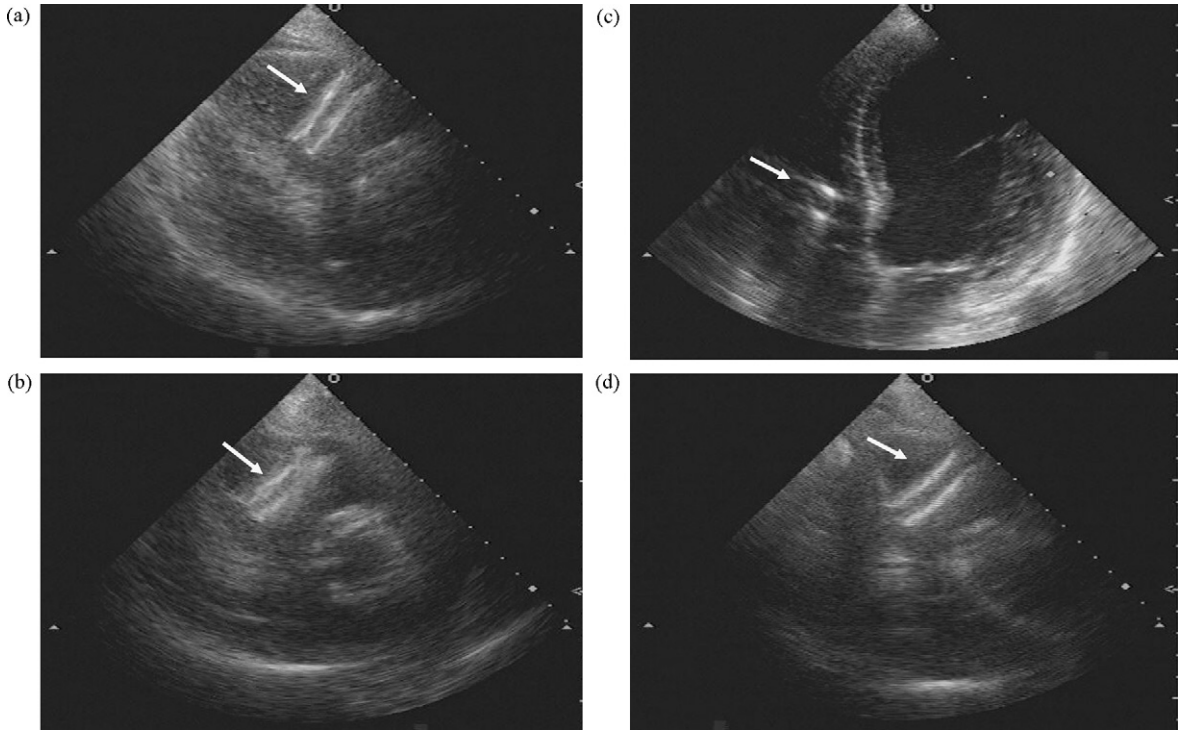

Figure 1 B-mode echocardiograms showing pipe-shaped structure with multiple slit and acoustic shadow (arrows) in right ventricle: (a) parasternal long-axis view; (b) parasternal short-axis view; (c) apical four-chamber view; (d) apical short-axis view.

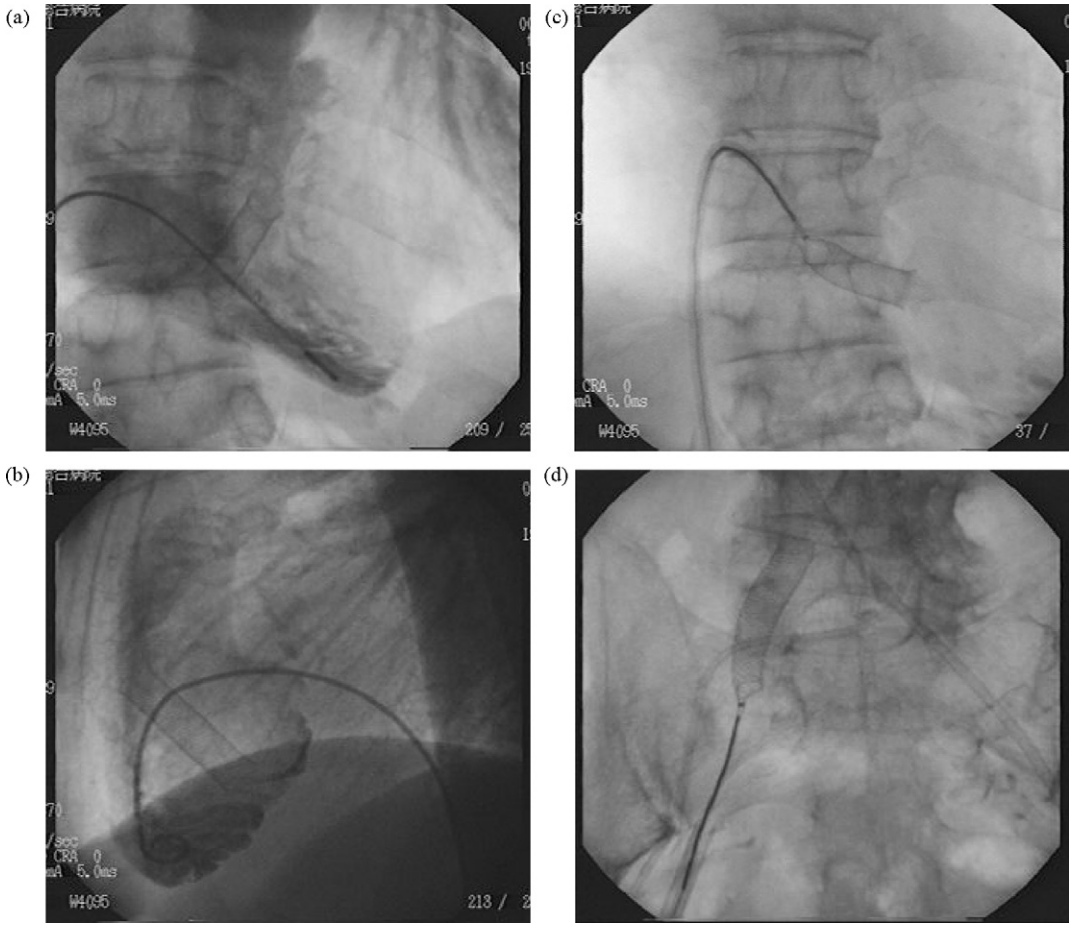

Figure 2 Right ventriculograms showing migrated venous stent in the right ventricle (a and b), and percutaneous transvenous stent extraction using Goose-Neck snare catheter (c and d). (a) RAO view; (b) LAO view; (c) stent retrieval from right ventricular cavity; (d) stent lodging in the right internal iliac vein.

with multiple slit and acoustic shadow in right ventricle (Fig. 1). He was transported to the catheter laboratory without delay, and underwent right ventricular temporary pacing. His radiographical right ventriculogram revealed the migrated venous stent between basal free and septal wall in the right ventricle (Fig. 2a and b). We did not select surgical removal of the venous stent because he had complications with renal failure and severe left ventricular dysfunction. We tried to perform percutaneous transvenous stent extraction using 6Fr Amplatz Goose-Neck snare catheter (C. R. Bard, Inc. USA) with 14Fr sheath introducer (Medikit, Tokyo, Japan) from right femoral vein (Fig. 2c and d). Although we succeeded in retrieving the stent from right ventricular cavity using this catheter, the wall stent stuck in the right external iliac vein, and contrast media leaked to the outside of the vascular wall while trying to catch and retrieve this stent through the venous sheath using a T-REX biotome catheter for the ventricular biopsy (Boston Scientific) (Fig. 3a). Therefore, we implanted this stent in the iliac vein with optimal-sized balloon inflation (Synergy balloon catheter, Boston Scientific; 10 mm/7.5 cm), and succeeded in stopping bleeding (Fig. 3). Complete atrioventricular block was recovered to sinus rhythm with left bundle branch block just after the removal of the venous stent from right ventricle, and no cardiovascular events occurred after the treatment.

Discussion

We experienced a case with venous stent migration into the right ventricular cavity causing transient atrioventricular block, and iliac venous wall rupture when performing stent extraction using Amplatz Goose-Neck snare catheter.

In the present case, we did not choose open-heart surgery and stent extraction. We thought that open-heart surgery with artificial cardiopulmonary

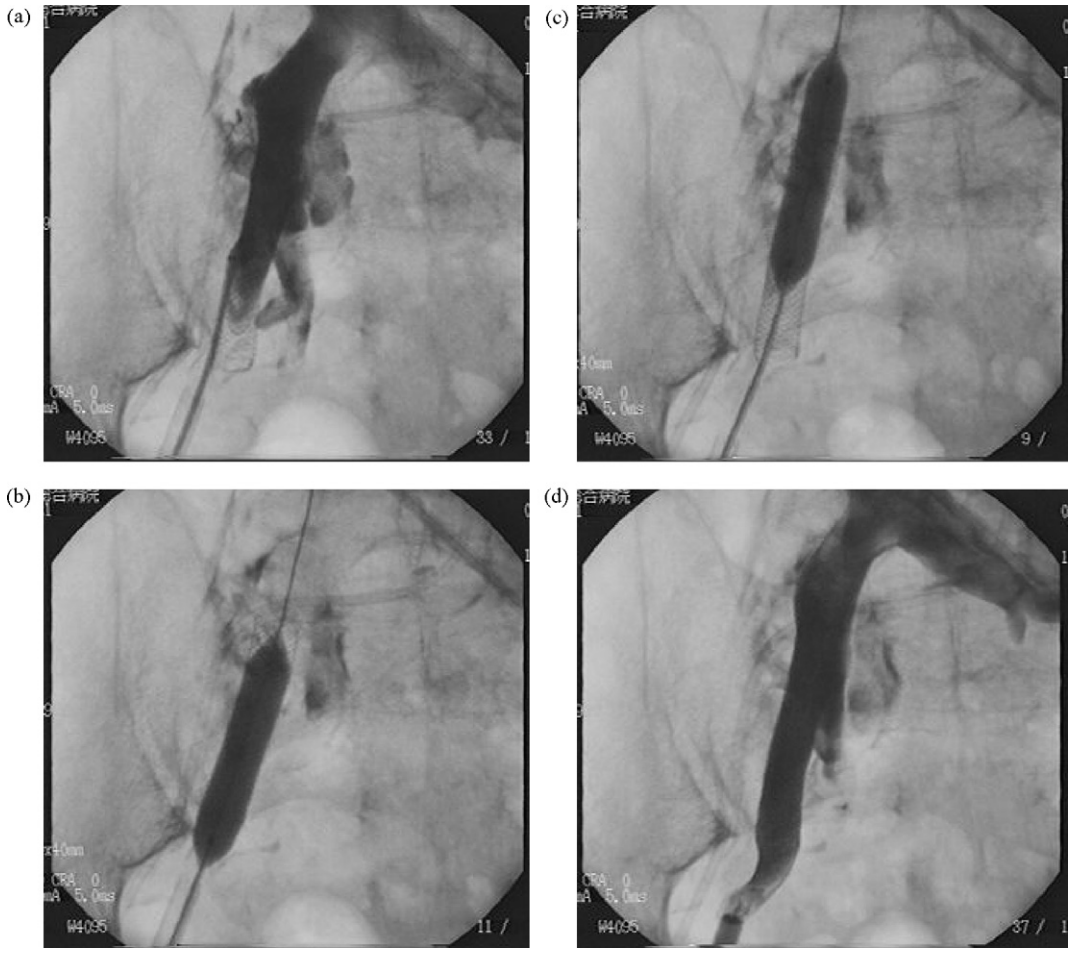

Figure 3 Radiographic angiograms showing contrast media leaked to the outside of the right external iliac vein (a), stent implantation and optimal-sized balloon inflation in the iliac vein (b and c), and after the balloon angioplasty (d).

bypass would be associated with a high risk of cardiovascular complications. This patient had renal failure and left ventricular dysfunction that seemed to be the dilated phase of end-stage hypertensive heart disease, because the patients' pathogenesis of chronic renal failure had been suspected to be renal sclerosis due to hypertension. Furthermore, we had to remove the venous stent as soon as possible because this patient had a symptomatic complete atrioventricular block. As a result, we succeeded in stent extraction by percutaneous and transvenous approach, and atrioventricular block was recovered to sinus rhythm.

It has been previously reported that a vascular stent was implanted to superior vena cava to improve superior vena cava syndrome [10]. These reports suggest that stent migration into the right atrium and/or ventricle by the stenting in the venous system has potentially fatal complications such as arrhythmias, thrombus, and/or infections, and is most likely to occur during the treatment of superior vena cava obstruction [5—7]. Furthermore, it has been reported that cardiac tamponade occurred by migrated inferior vena cava filter implanted for a case with deep venous thrombosis [11]. In our experience, it is thought to be rare that the vascular stent implanted in the left innominate vein migrated to the right ventricle and caused transient and complete atrioventricular block. It is speculated that vascular stents might be liable to migrate in the venous system as compared to the arterial system that has intimal proliferation and comprehension.

Migration and/or dislodgement of coronary stents sometimes occurred and were retrieved with balloon catheters, guide wires, guiding catheters, and direct snaring [3—6]. In the present case, we used Amplatz Goose-Neck snare catheter to retrieve migrated venous stents according to a few previous reports [3,6,8,9]. Although we succeeded in retrieving the stent from the right ventricular cavity using this catheter, the wall stent stuck

in the right external iliac vein and vascular rupture occurred. The wall stent is a self-expanding stent, therefore, stent diameter in the present case might be larger than 14Fr venous sheath introducer catheter in spite of using this sheath as large lumen as possible. On the other hand, it might be useful to implant migrated stent in the sticking site using optimal-sized balloon inflation to stop bleeding and repair venous rupture [12].

Venous thrombosis, pulmonary embolism, and complete atrioventricular block without anti-coagulant therapy have not occurred for 2 years. Three years passed from the implantation of venous stent, and he has received anti-coagulant therapy for persistent atrial fibrillation.

We have reported here a case of self-expanding stent migration from innominate vein into right ventricle that caused transient and complete atrioventricular block. We used Amplatz Goose-Neck snare catheter and succeeded to retrieve the migrated venous stent from right ventricle, however, the stent stuck in the iliac vein and caused vascular rupture. Further experience is required to retrieve the migrated venous stent safely and quickly.

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